



Swine Brucellosis in Florida

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***Brucella* Species Capable of Causing Human Illness**

- *Brucella melitensis* (goats/sheep)
- *Brucella abortus* (cattle, bison, elk, caribou, moose)
- *Brucella suis* (swine)
- *Brucella canis* (dogs)
- *Brucella ceti* and *Brucella pinnipedialis* (marine mammals)



Photo credit David Pearce, FDOH in Escambia County

Brucellosis Reporting in Florida



- *Brucella abortus*, *B. melitensis* and *B. suis* infections in animals reportable to Florida Department of Agriculture and Consumer Services (FDACS)
- Human illnesses caused by any species of *Brucella* reportable to Florida Department of Health (FDOH)

Human Brucellosis Case Definition

- An illness characterized by acute or insidious onset of fever and one or more of the following: night sweats, arthralgia, headache, fatigue, anorexia, myalgia, weight loss, arthritis/spondylitis, meningitis, or focal organ involvement (endocarditis, orchitis/epididymitis, hepatomegaly, splenomegaly).

Confirmed

- Culture and identification of *Brucella* spp. from clinical specimens
- OR
- Evidence of a fourfold or greater rise in *Brucella* antibody titer between acute- and convalescent-phase serum specimens obtained greater than or equal to 2 weeks apart

Probable

- *Brucella* total antibody titer of greater than or equal to 160 by standard tube agglutination test (SAT) or *Brucella* microagglutination test (BMAT) in one or more serum specimens obtained after onset of symptoms

OR

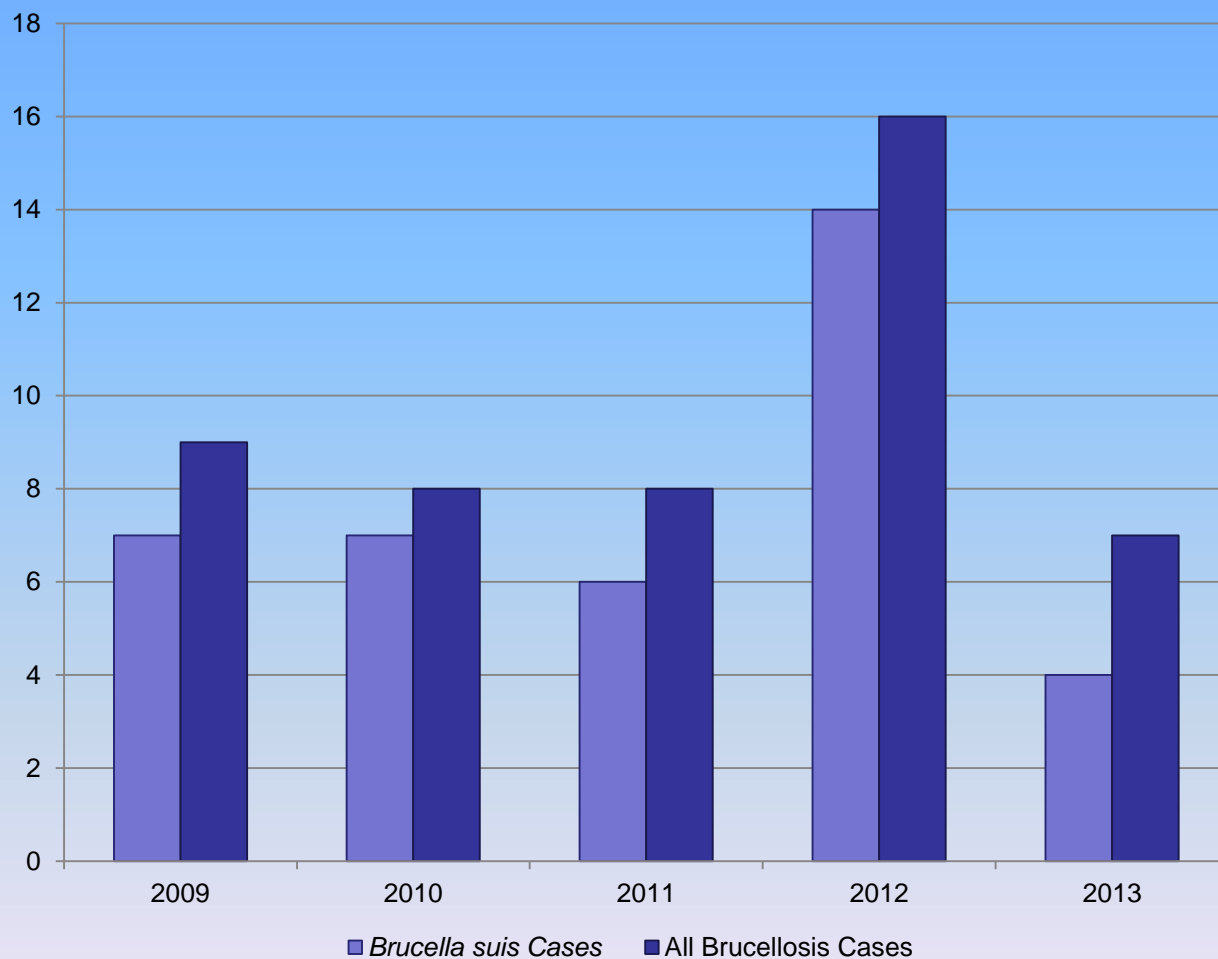
- Detection of *Brucella* DNA in a clinical specimen by PCR assay

***Brucella suis* in Florida**

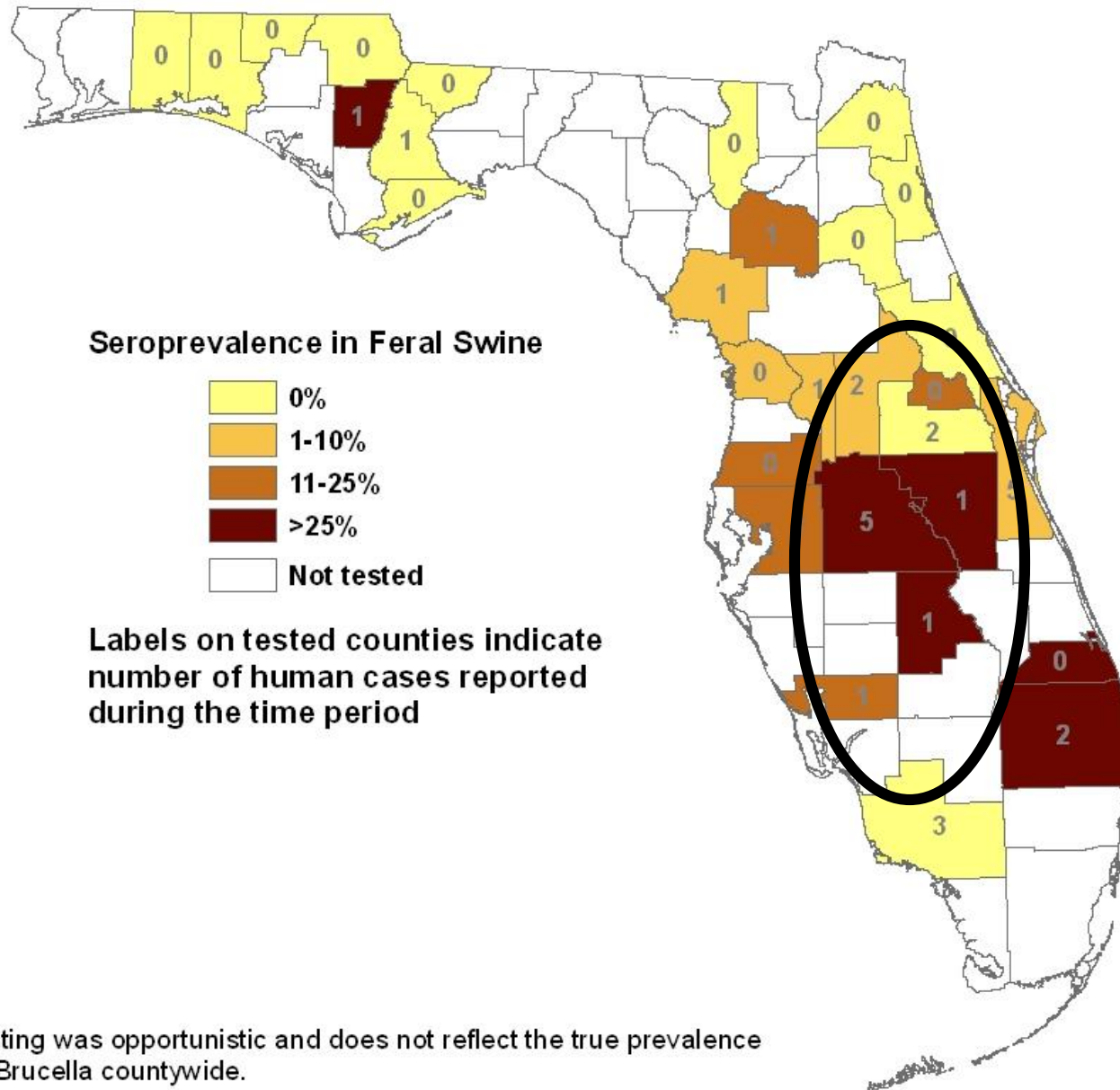
- Second highest feral swine population in the U.S.
- 1963-1975: 61 human brucellosis cases reported in Florida
 - 39% swine related
 - 13% pig hunters



Florida Brucellosis Cases: 2009-2013



Proportion of Brucella Positive Feral Swine, 1997-2009



Transmission

- 10-100 organisms infectious dose
- Direct contact of infectious blood, uncooked meat or organs of infected animals with breaks in skin or mucous membranes
- Ingestion of unpasteurized milk or inadequately cooked meat
- Inhalation or mucosal exposure to aerosolized bacteria
- Live vaccines for animals Strain 19, Rev-1, RB51
- Rare person-to-person (sexual, breast feeding, in utero, organ transplant, transfusion)



***Brucella suis* in Swine**

- Continuous bacteremia 5 weeks
- Intermittent bacteremia up to 34 weeks
- Meat from positive swine PCR positive



Photo credit Cindy Seegers, FDOH in Lake County

Farming Pigs in Florida



Photo credit: Mark Krause USDA-APHIS, VS

Feral Swine and Cattle

- 10-15 sporadic *B. suis* infections in FL cattle annually, most often in dairy animals
- Can localize in udder
- Bulk milk testing positive; additional testing often culture positive milk
- Raw milk transmission risk to humans



Hunter *Brucella* Exposure

- Cuts while dressing a hog out
- Open wound exposure to hog blood or raw meat or organs
- Splash or spray to eye or mucous membrane with hog body fluid
- Eating uncooked or undercooked meat or organs from a hog



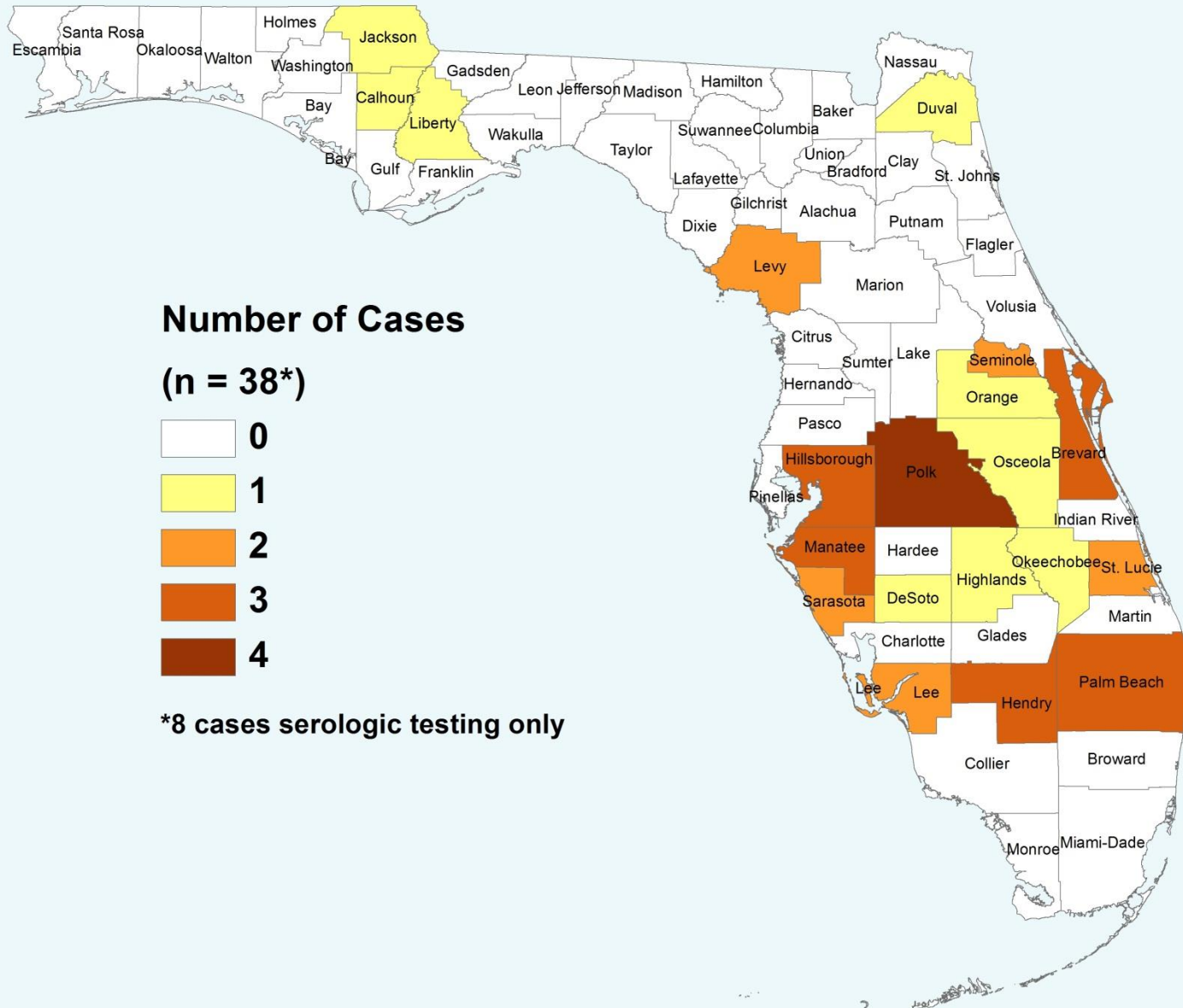
Courtesy of CDC and USDA-APHIS

Brucella suis Hunting Exposure



Photo credits Barry Inman, FDOH in Brevard County

Human *Brucella suis* Cases, 2009-2013



***Brucella suis* 2009-2013**

- 89% (34) male
- 92% white; 87% non-Hispanic
- 1-69 years; median age 37
- 1 household cluster involving a 7 year old girl who assisted her father with dressing out a hog
- 3 cases with a likely false culture result of *Ochrobactrum*



N = 38: 30 culture confirmed; 8 MAT positive for smooth *Brucella*

Risk Factors

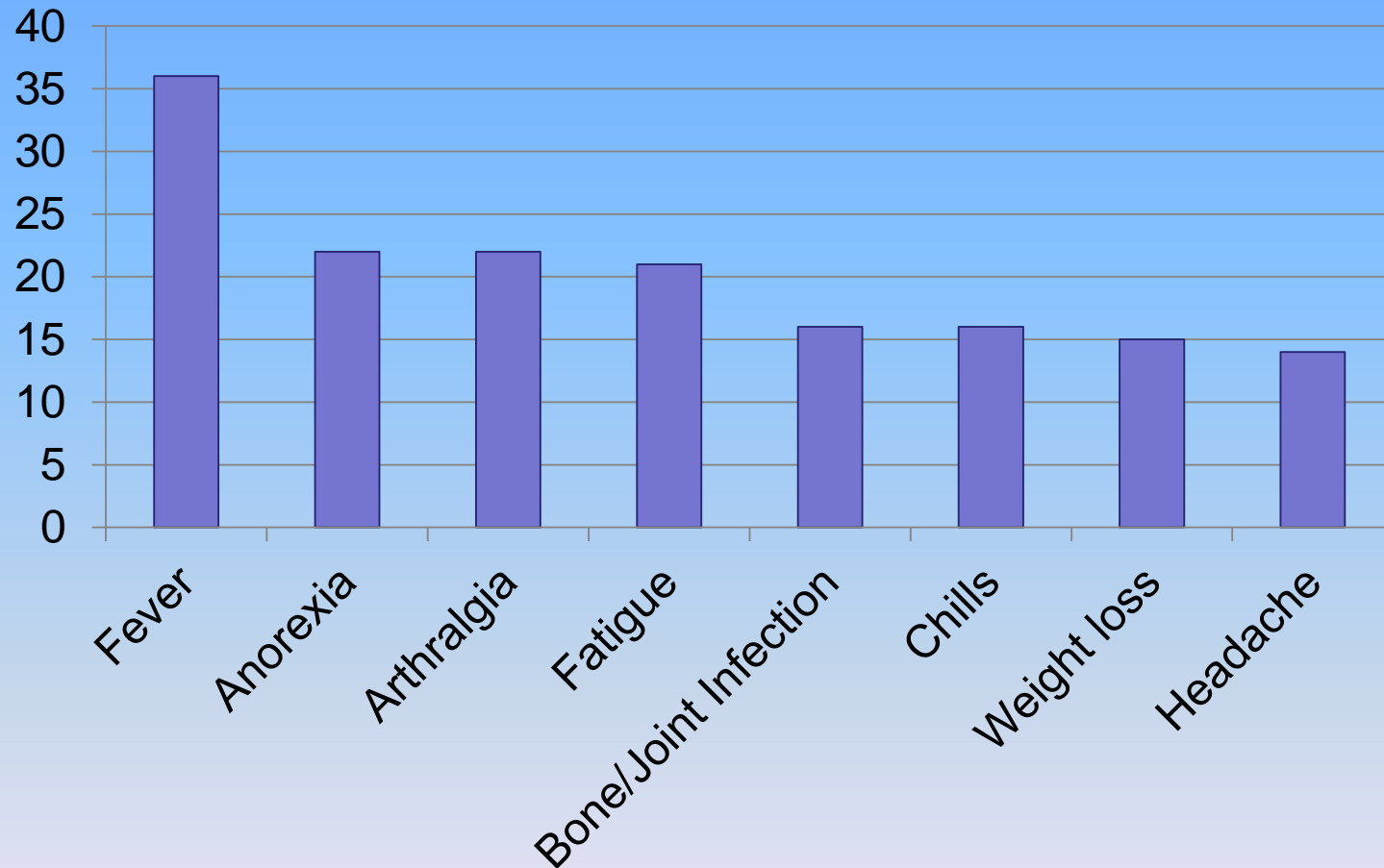
- 89% hunting &/or handling raw hog meat
- 89% of hunters did not regularly use gloves
- 13% ate hog meat; 8% undercooked
- 11% reported cuts while hunting
- 8% reported eating unpasteurized milk products
- 5% occupational risk (1 veterinarian, 1 dairy worker)

Brucellosis Clinical Signs

- Incubation from 5 days to 5 months
- May cause intermittent symptoms
- Insidious presentation often unrecognized
- Chronic localized infection in joints, bones and organs including heart



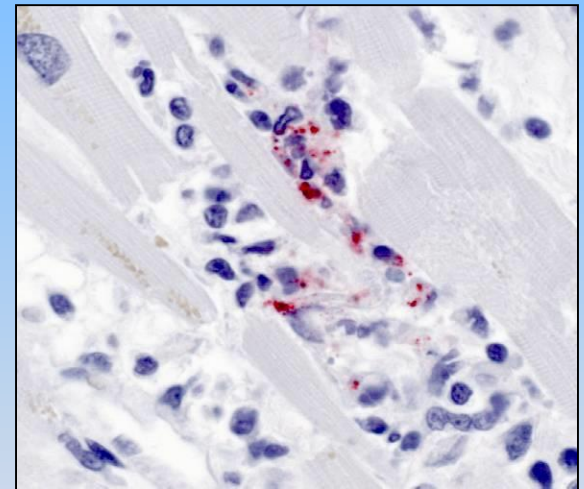
Common Symptoms of Brucellosis: 2009-2013



N=38 probable and confirmed cases

***Brucella suis*: Clinical Presentations**

- 3-5% FL cases in past 5 years with serious cardiovascular complications (vs. 17% previous 5 years)
- 1 fatal case 46 years of age
- 16% joint and bone infections
- 1 kidney removal
- Time to diagnosis
 - 6 week median
 - Range 1-135 weeks



Chris Paddock CDC

***Brucella suis* cases**

- 4 culture positive persons denied direct feral swine contact
 - Person with vague history of feral swine around home
 - Homeless person with poor recall
 - Former spouse of a pig hunter
 - Child 22 months of age

***Brucella* Testing**

- Culture gold standard
- Polymerase chain reaction (PCR)
- Serology: microagglutination test (MAT)
- Serology: enzyme-linked immunosorbent assay (ELISA)

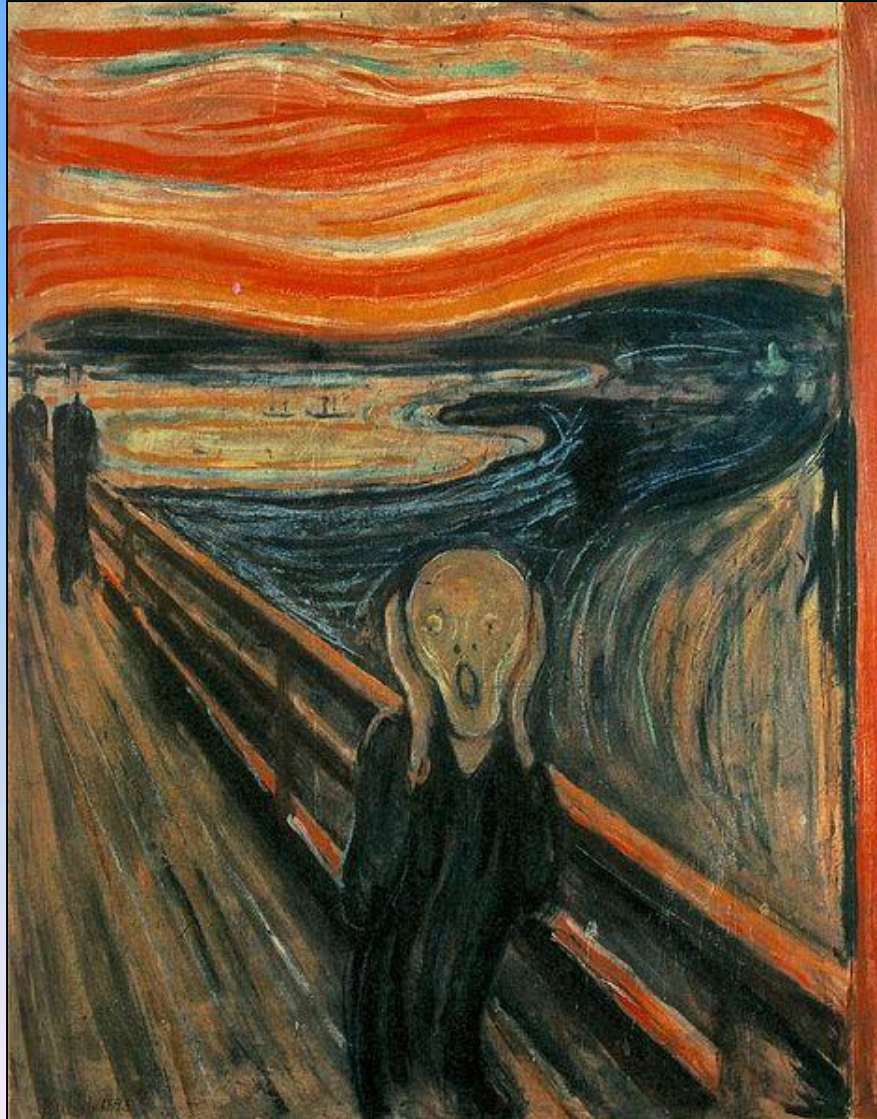


Brucellosis Treatment

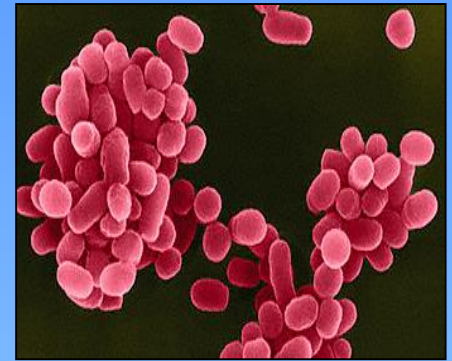
- Ioannina recommendations
- Antibiotics for at least 6 weeks
- No monotherapy (two or more antibiotics needed)
- Treatment failure and relapses reported to be 4.6-24% for oral treatment; 5-8% for oral-parenteral treatment
- 22% treatment failure and relapses for *Brucella suis* (FDOH data 1999-2008)



Lab Exposures: When the Unexpected Happens



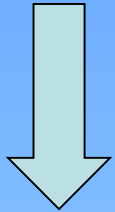
***Brucella* and Laboratory Exposures**



- Brucellosis: one the 10 most frequently reported laboratory-acquired infections (LAI) in the U.S. (Traxler, 2010)
- 2009: 41% of 120 reported U.S. brucellosis cases resulted in laboratory exposures.
- 2009-2013 Florida *Brucella* lab exposures ranged from 16-115 annually

FL-NC *Brucella* Exposure

Index Case FL



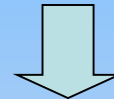
Lab A FL

5 high-risk exposures
6 low-risk exposures

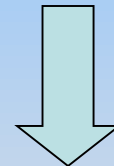


Lab B NC

5 high-risk exposures
1 low-risk exposure



LAI Case NC



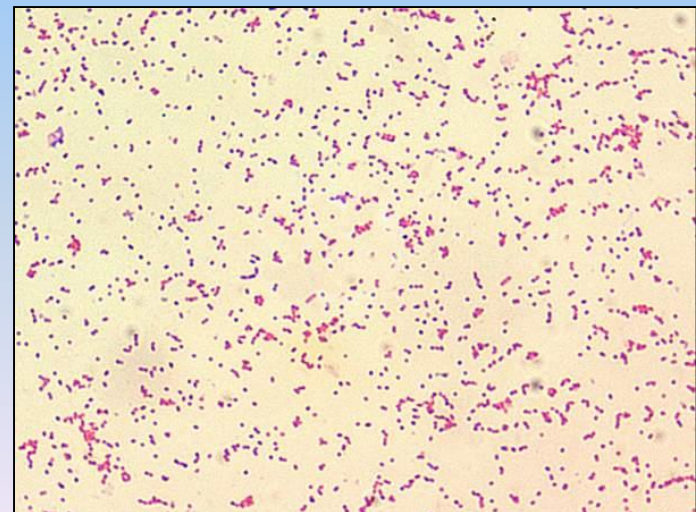
Lab C NC

11 high-risk exposures
24 weeks after Lab A exposures

- 2 week delay in initiation of PEP
- Onset week 8 after PEP initiation

Lab Exposure Causes

- *Brucella* uncommon
- Failure in communication
- Clinician or lab staff does not realize aerosol potential
- Sniffing cultures
- Testing failures/anomalies
 - Automated biochemical machine misidentification *Ochrobactrum*
 - Gram stain variable or positive (*Micrococcus*)
 - Catalase failure



***Brucella* Surgical Exposures**

- Aerosol generating procedures: drilling, saws, high pressure irrigation
- Airborne precautions
- Theoretical risk; no cases linked to date
- Human and animal necropsies or autopsies



From: <http://hq.afnews.af.mil>

Post-Exposure Management

- Submit isolate for confirmation to state lab
- Serologic follow-up, 6 month fever watch, antibiotic prophylaxis



Brucellosis and Pets



Brucellosis in a Child

- 22 month old child with 10 day duration of joint pain then fever
- Culture positive for *B. suis*
- 3 pigs, 5-6 dogs (2 bull dogs, 2 curs, 1 or 2 labs), possibly 3 cows, chickens
- Parents report hunting feral hogs regularly but deny eating feral or owned hogs
- Child reportedly only had contact with the dogs
- Bull dog had pups 6-9 months prior but all pups died within 24 hours
- 3 of 5 dogs and 1 of 3 pigs serologically positive for smooth *Brucella*

Canine *Brucella suis* Case

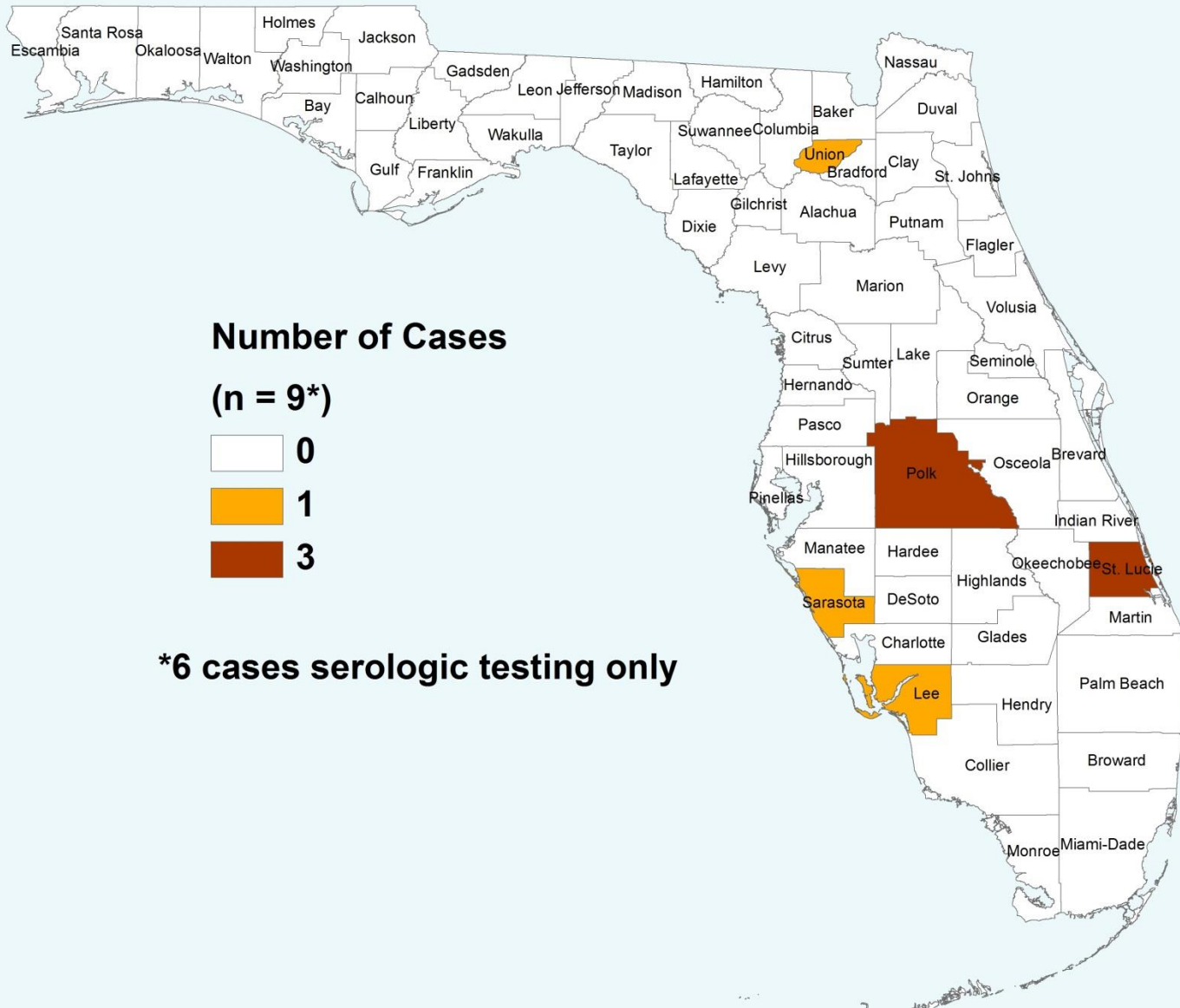
- 7+ year old male neutered cattle dog
- Bone plate on leg 7 years ago
- Fight with unknown animal in woods 2 years ago
- Recent lameness in the leg with the plate: suspect loose plate
- Surgery to repair plate increased suspicion of an infectious process
- Culture positive *B. suis* resulted in exposure assessment of lab and surgical staff

Brucella suis in Dogs

Year	Breed	Spayed/Neutered	Testing	Exposure	Illness
2014	cattle dog	M(N)	culture	farm	bone plate infection
2013	1 black lab 2 bull dogs	F(S) lab M(I) & F(I) bull dogs	serology	farm hunting	newborn pups died
2013	bull dog	M(I)	culture	farm	unilateral orchitis
2012	mixed breed	F(S)	culture	farm	disco- spondylitis
2012	3 hunting dogs	M(I), 2 unknown	serology	hunting	unilateral orchitis

M=male; N= neutered; F= female; S=spayed; I=intact

Canine *Brucella suis* Cases, 2012-2014



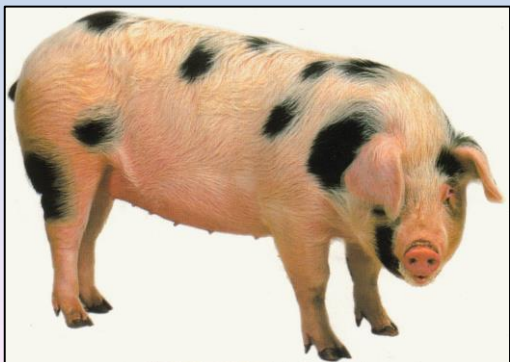
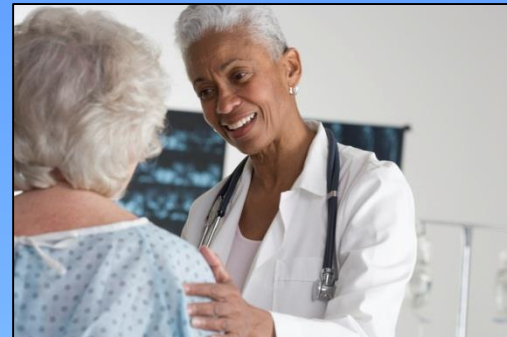
Canine *Brucella suis* Risk

- Undetermined risk to people
- No studies demonstrating curative treatment protocol for infected dogs
- Need data-based recommendations for dog owners whose pets hunt or live on farms

Prevention and Control

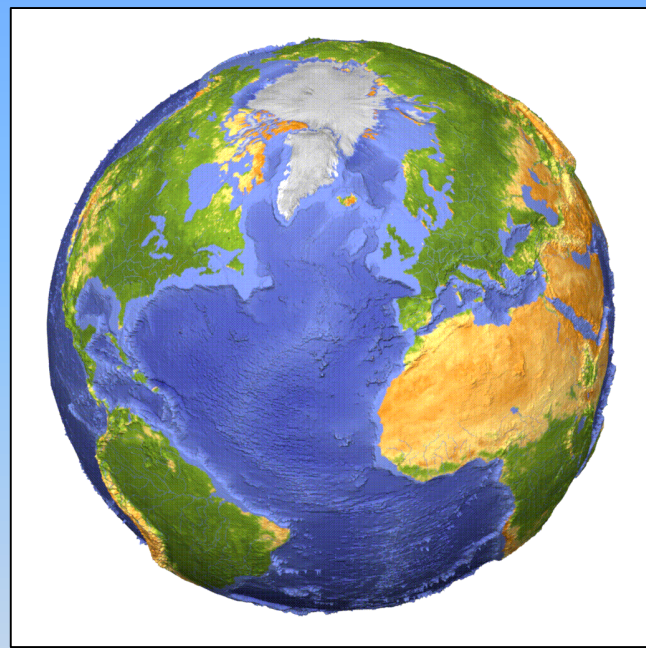
- CDC-USDA brucellosis prevention hunter flyer distributed by FDACS to feral swine transport permit holders and by USDA WS to their contacts
- Newsletter and other outreach to commercial labs from FDOH Public Health Laboratories to increase awareness on how to prevent exposures
- USDA-APHIS, WS conducts opportunistic testing of feral swine and shares findings with partners to help direct outreach
- Shared response with FDACS and FDOH for human cases involving domestic animals or if possibility of importation of non-endemic *Brucella*
- Outreach to human health care providers from FDOH related to brucellosis in people; veterinary and pet owner guidance forthcoming
- Additional surgery exposure guidance from CDC





One Health-One Medicine!

- Brucellosis in wildlife can impact hunters, human and veterinary health care providers, laboratory staff, pets, families and domestic livestock health.
- Shared surveillance and outreach are important tools to help reduce risk for people and animals.



Resources

- FL DOH Brucellosis: <http://www.floridahealth.gov/diseases-and-conditions/brucellosis/index.html>
- CDC Brucellosis: <http://www.cdc.gov/brucellosis/>
- CDC Biosafety Resources: <http://www.cdc.gov/biosafety/publications/index.htm>
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- CDC Feral Hog Hunting Safety: http://www.cdc.gov/brucellosis/pdf/brucellosis_and_hoghunters.pdf
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- Photo credit for first slide: Dr. C. Dix Harrell, USDA-APHIS, Veterinary Services

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